PV Power Control Box

User Manual

Thank you for choosing a product from our range.

The accessories described in this manual are high quality products that have been carefully designed and manufactured to ensure the highest performance.

This manual provided detailed instructions on how to use and install the accessory.

Please READ THE MANUAL CAREFULLY BEFORE YOU USE THE DEVICE and keep it handy near the device for consultation on how to take full advantage of the features of your new purchase.

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The manufacturer reserves the right to make improvements to the equipment described in this manual at any time and without prior notice.

SAFETY

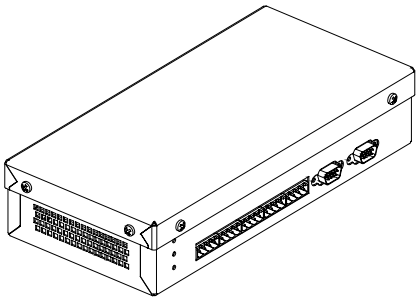
This part of the manual contains SAFETY instructions that should be followed scrupulously.

- The equipment must not be used without a ground connection if it is powered at high voltage.
- Ensure that the connectors subjected to high voltages are correctly isolated.
- All the models in this range have been built for professional purposes and are therefore not suitable for use in a domestic environment.
- The equipment has been designed for use in closed environments. It should not be installed near inflammable liquids, gas or any other toxic substances.
- Ensure that water or any other liquid and/or objects do not fall into the equipment.
- Do not attempt to repair any failures and/or abnormal operation, but contact the nearest technical support centre.
- The equipment must be used only for the purpose for which it was designed. Any other use is considered improper and therefore dangerous. The manufacturer is not liable for any damage caused by improper, incorrect or unreasonable usage of the equipment.

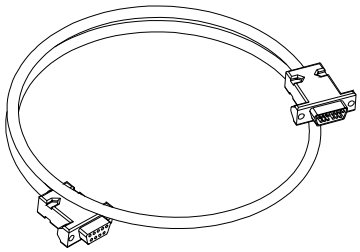
Packaging

The packaging should contain:

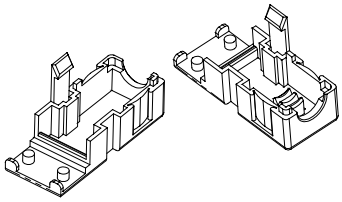
- ***PV Power Control Box***



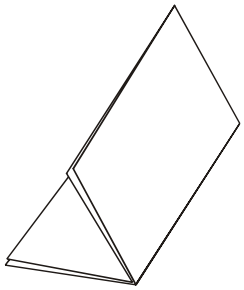
- Serial cable



- Three-pole connector cover and cable tie



- The User Manual



NOTE: the configuration Software is available on the WEB Site:

http://www.ups-technet.com/ (Photovoltaic Area)

How it works

The Photovoltaic Power Control monitors a set of 8 inputs and if a configured condition on the inputs is matched (it is possible to configure a maximum of 24 patterns), it sends appropriate commands to the inverter connected to the Serial 2 port (RS232 or RS485 bus).

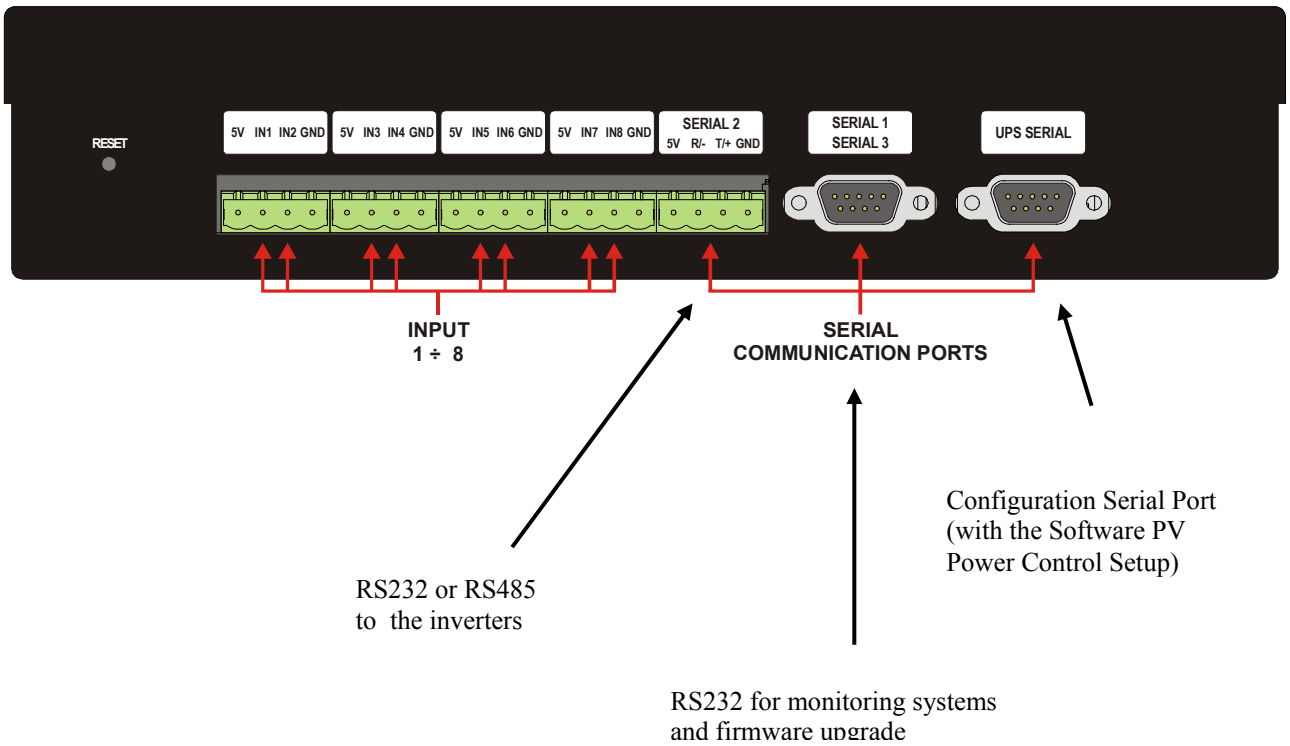
It is possible to control:

- The maximum active power generation (in % of inverter rated power)
- The reactive power production (in % of inverter rated power)
- The Power Factor of the generated current.

To confirm that all the inverters have received the new set of parameters or commands, it can output on a set of 8 relays a configured single relay or can copy the input pattern on the relais output.

It's compatible with PVSER protocol, so it allows the software compatible with this protocol to act as a bridge towards the RS485 bus where the inverters are connected. In the following table there is a summary of the serial port use.

Serial port	Use
Serial 1	This serial can be used to update the Photovoltaic Power Control board or for the PVSER protocol
Serial 2 (RS232 or RS485)	where inverters are connected
Serial 3	Not used
UPS Serial	Configuration software serial port.



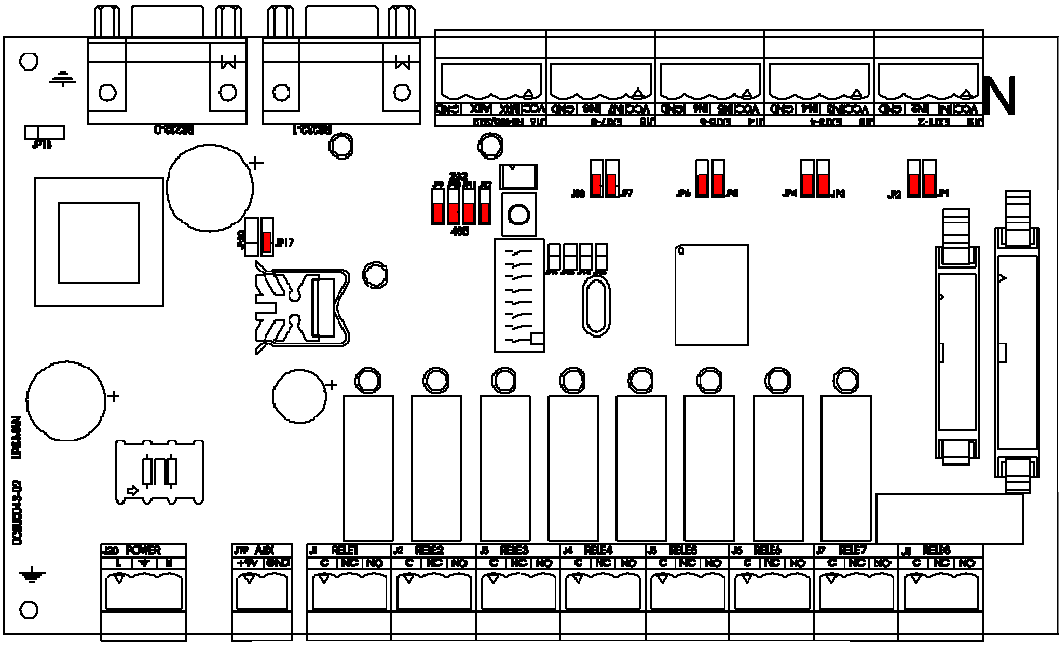
Hardware configuration: jumpers

RISK OF ELECTRIC SHOCK.
MAKE SURE THAT THE DEVICE IS SWITCHED OFF BEFORE TOUCHING THE JUMPERS.

-- PV Power Control Box --

- **Remove the cover, by unscrewing the screws that hold it in place, to access the jumpers.**
- **Do not switch on the device without the cover, as some parts of the circuit remain powered with high voltage**
- **For safety, the cover must screwed back in place using the screws and washers provided.**

In the following figure we have the default jumper settings, positions highlighted in red.



Hardware configuration: DIP switches

The DIP Switch 1 MUST be set to on, the others to 0.

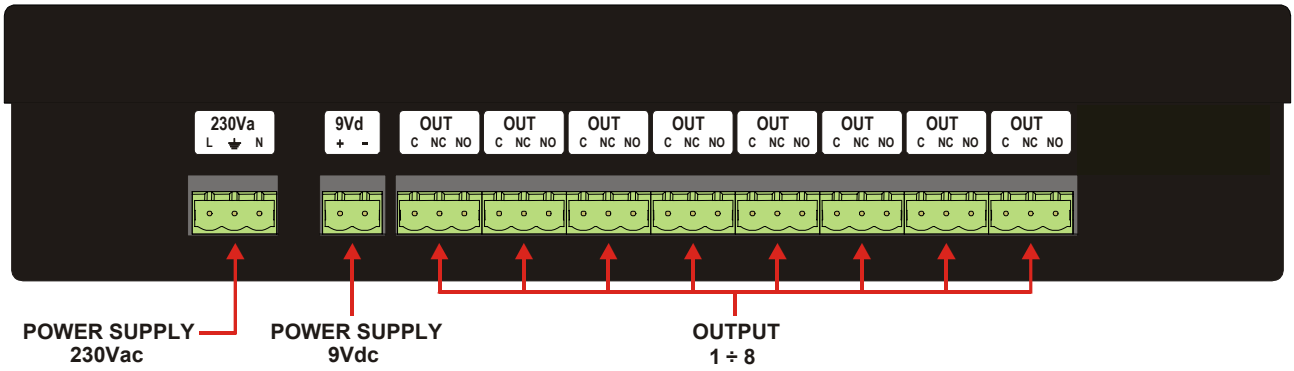
Termination resistance of the RS-485 bus

The device is supplied with the termination resistance already mounted inside (Rt=120Ω). Change the position of DIP-switch 6 to insert this resistance:

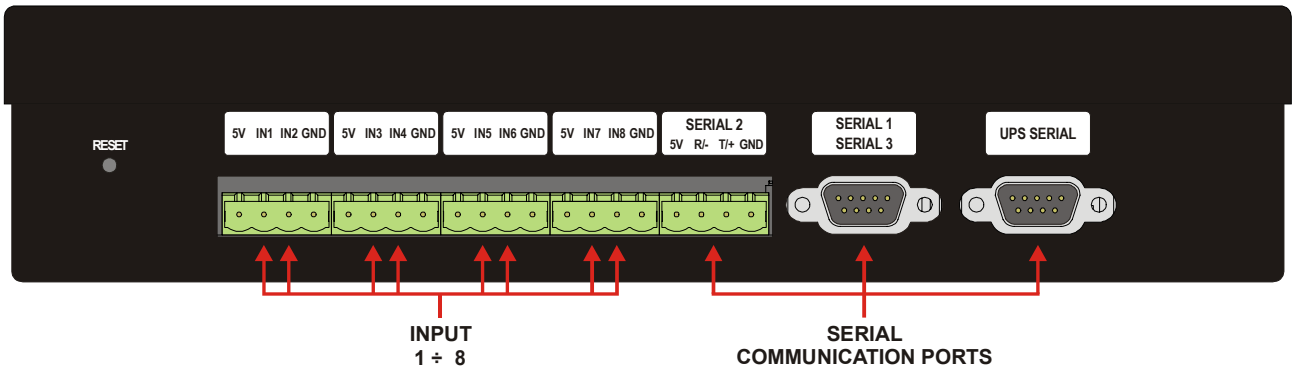
- DIP-switch n° 6 ON → Rt inserted
- DIP-switch n° 6 OFF → Rt not inserted [DEFAULT value]

Connectors

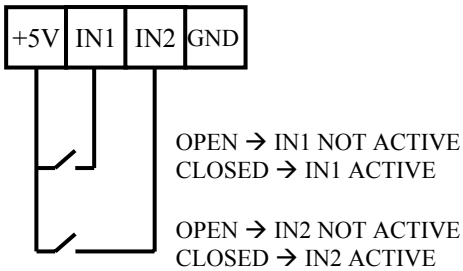
Front view:



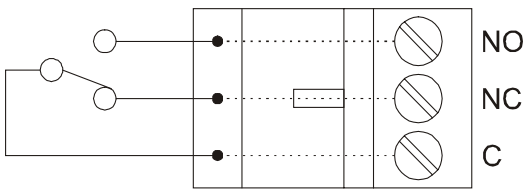
Rear view:



STANDARD INPUT
CONFIGURATION



SCHEMATIC DIAGRAM FOR THE INPUT CONNECTION

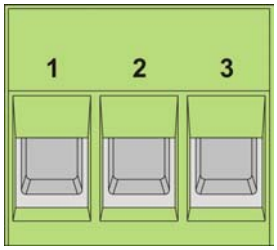


SCHEMATIC DIAGRAM FOR THE OUTPUT

The connectors

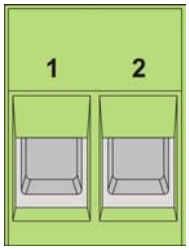
ALL CONNECTIONS SUBJECTED TO VOLTAGE OF MORE THAN 50V MUST COMPLY WITH SAFETY REGULATIONS

230 Vac Power supply



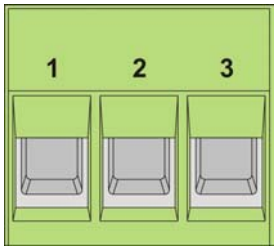
PIN #	SYMBOL	DESCRIPTION
1	**L**	PHASE
2	⏚	GROUND
3	**N**	NEUTRAL

9 Vdc Power supply

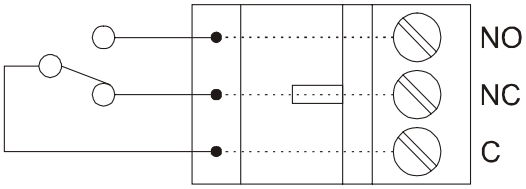


PIN #	SYMBOL	DESCRIPTION
1	**+**	+ 9 Vdc
2	**-**	GROUND

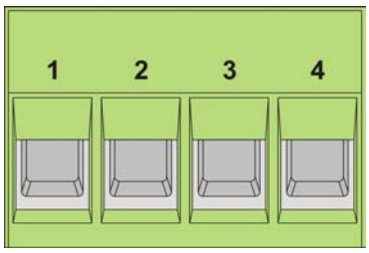
OUTPUT 1 - OUTPUT 8 Terminal board



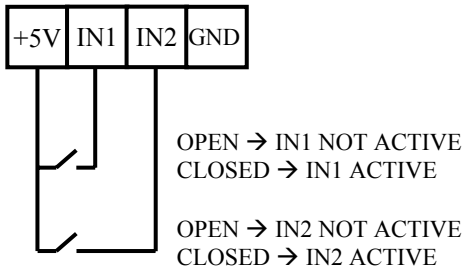
PIN #	SYMBOL	DESCRIPTION
1	**C**	COMMON
2	**NC**	NORMALLY CLOSED
3	**NO**	NORMALLY OPEN



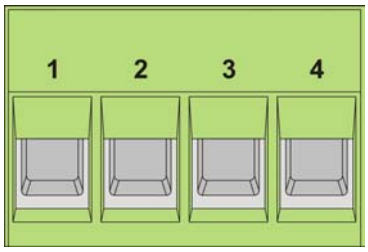
NOTE: The "COMMON" contacts of the eight relays are all separate. All the output contacts are at zero potential.

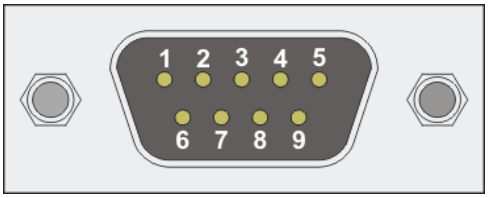
INPUT 1 - INPUT 8 Terminal board		
		
PIN #	**SYMBOL**	**DESCRIPTION**
1	**5V**	POWER SUPPLY (1)
2	**IN1** (2)	INPUT 1
3	**IN2** (3)	INPUT 2
4	**GND**	GROUND

STANDARD INPUT CONFIGURATION



(1) See the "TECHNICAL SPECIFICATIONS" for the maximum loads supported.
(2) Depending on the terminal board IN1 (INPUT 1) becomes IN3 (INPUT 3), IN5 (INPUT 5), IN7 (INPUT 7)
(3) Depending on the terminal board IN2 (INPUT 2) becomes IN4 (INPUT 4), IN6 (INPUT 6), IN8 (INPUT 8)

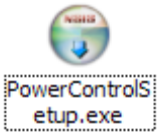
SERIAL 2 Terminal board			
			
PIN #	**SYMBOL**	**SIGNAL**	
		RS485	**RS232**
1	**5V**	POWER SUPPLY	
2	**R/-**	RXTX-	RXD
3	**T/+**	RXTX+	TXD
4	**GND**	GROUND	

SERIAL 1 – SERIAL 3 Connector	
	
PIN #	**SIGNAL**
1	n.c.
2	SERIAL 1 RXD
3	SERIAL 1TXD
4	SERIAL 3 TXD
5	GROUND
6	SERIAL 3 RXD
7	RTS
8	n.c.
9	n.c.

n.c. → not connected

Configuration software

In order to configure the Photovoltaic Power Control a configuration software is needed.

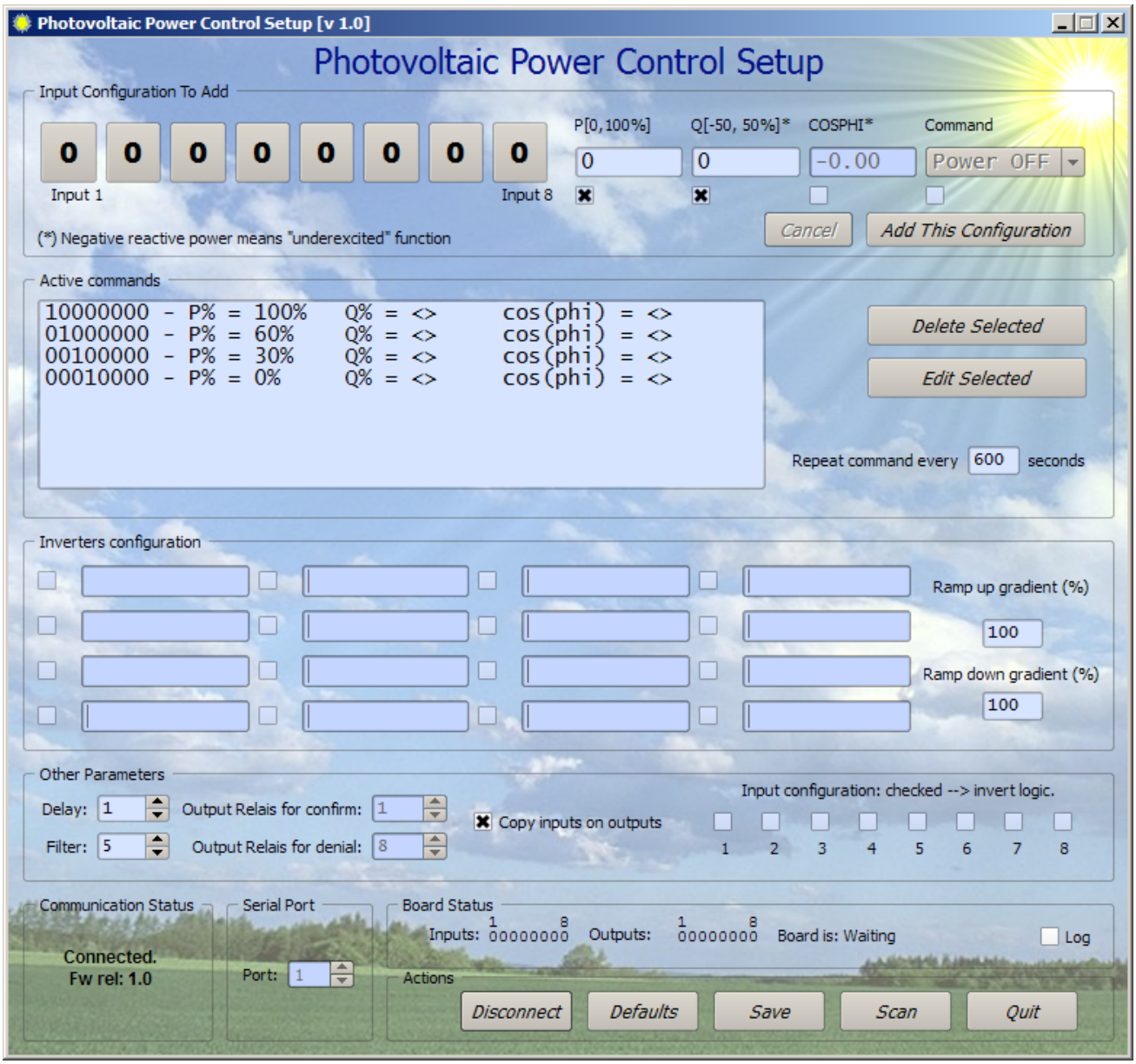


Download the software from http://www.aros-solar.com

To install the software, double-click on PowerControlSetup.exe and follow instructions.
The software is installed into C:\Program Files\RPS\PowerControlSetup. Double click on the PowerControlSetup.exe icon.

Description

The software can configure the Photovoltaic Power Control using a serial connection. Choose the correct serial port, connect the cross serial cable to the "UPS Serial" connector and press the **Connect** button. The software reads and shows the configuration in a few seconds.



The picture shows the “default configuration” and four pattern are configured:

Relay 1 closed: no power reduction, no reactive power setting, no power factor setting.
Relay 2 closed: active power reduction at 60% , no reactive power setting, no power factor setting.
Relay 3 closed: active power reduction at 30% , no reactive power setting, no power factor setting.
Relay 4 closed: active power reduction at 0% , no reactive power setting, no power factor setting.

With this software is possible:

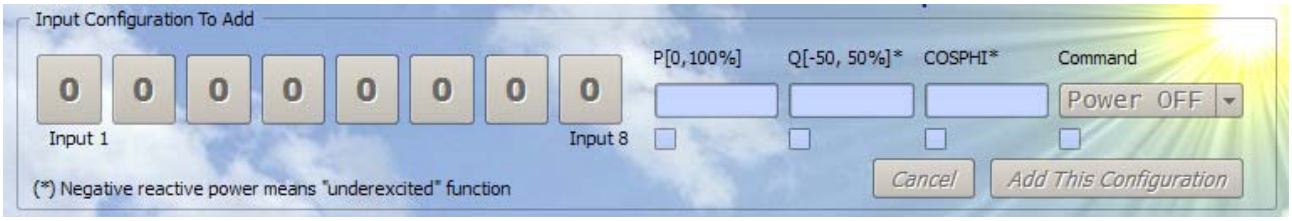
1. To configure all the parameters needed by Photovoltaic Power Control to operate with at most 16 inverters at the same time
2. To choose any pattern made by 8 inputs and store them on the Photovoltaic Power Control, and configure the appropriate parameters. The pattern “00000000” (all inputs open) is not usable and means inverter default. The maximum number of patterns is 24.
3. To edit any stored input pattern configuration and modify it.
4. To trim the Photovoltaic Power Control parameters
5. To send the modified configuration to the Photovoltaic Power Control
6. To send to the Photovoltaic Power Control a Scan command to automatically report all the connected inverters
7. To restore the parameters to default values, if needed.

The main window of the software is divided into sections.

The main window sections

Input Configuration section

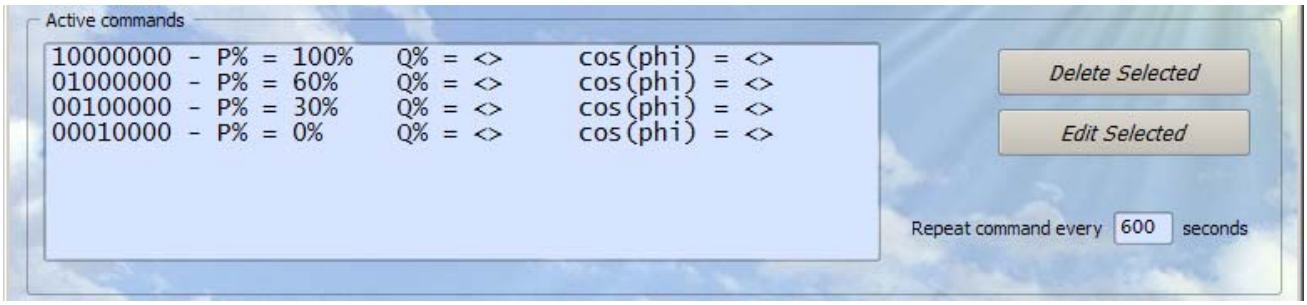
This section allows the user to add a specific configuration to the existing list of Active Commands; clicking on a single button on the left side of the section, the user can toggle each button from 0 to 1 and back from 1 to 0. This can be done for each of the 8 buttons (Input1 .. Input8).



The chosen pattern can be associated to the P (Active Power), Q (Reactive Power) and COSPHI (Power Factor) parameters. These parameters will be sent to the configured inverters.
It’s possible to send also a Power Off or a Power On command. To add the chosen configuration, click on the **Add This Configuration** button.
When the user inputs an invalid configuration an error message informs the user and the configuration is not added.
In order to save the added configuration, click on the **Save** button.

Active Commands section

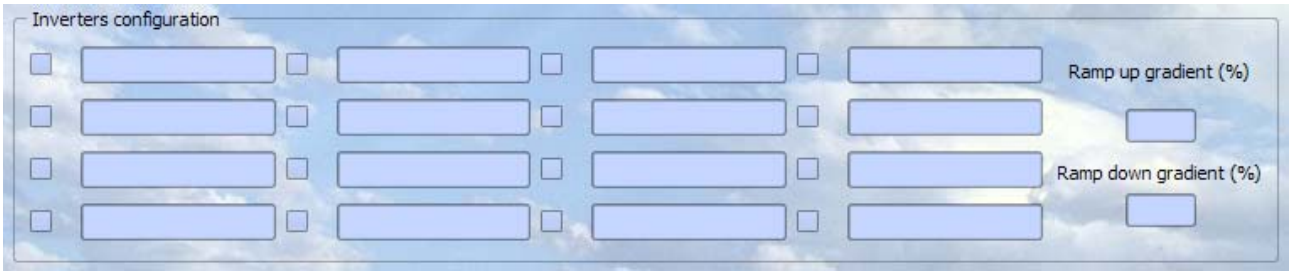
The active commands section lists all the valid configurations stored on the Photovoltaic Power Control. Within this section can be set also the number of seconds between commands repetition. Each configured command can be selected. When selected the user can click on the **Delete Selected** or on the **Edit Selected** buttons.


Active commands
10000000 - P% = 100% Q% = <> cos(phi) = <>
01000000 - P% = 60% Q% = <> cos(phi) = <>
00100000 - P% = 30% Q% = <> cos(phi) = <>
00010000 - P% = 0% Q% = <> cos(phi) = <>
Delete Selected
Edit Selected
Repeat command every 600 seconds

The first button deletes the selected configuration, while the second one allows the user to review parameters and also to change the input pattern. After the user has done the modifications, the button Save must be clicked to transfer the configuration to the Photovoltaic Power Control.

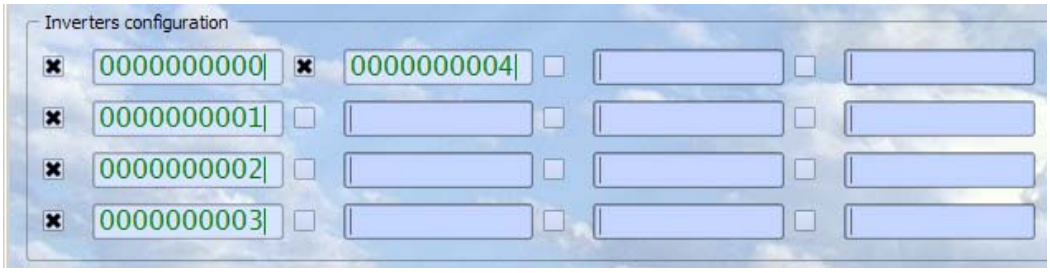
Inverters Configuration section

Up to 16 inverters can be added in this section. For each inverter the user can input a serial number (up to 10 chars) and can activate/deactivate the sending of the command. When the Photovoltaic Power Control is connected to the 485 bus, inverters side, clicking on the **Scan** button activates an automated procedure to acquire the identification number.



No inverter are configured

Once the procedure ends, the **Save** button must be clicked to save the configuration on the Photovoltaic Power Control.



Five inverter are connected to the PV Power Control Box

NOTE: each inverter must have a different IDENT NUMBER (see the inverter manual in order to change this number)

Other Parameters section

In this section the user can change the following parameters:

- Delay: this time, expressed in seconds, is the time between the acquisition of the input configuration and the effective recognition of the valid input configuration
- Filter: this time, expressed in seconds, is the time an input configuration must be stable to be acquired.
- Output Relays for confirm: this is the output relay that will be used in case ALL the inverters have accepted the input configuration
- Output Relays for denial: this is the output relay that will be used in all other cases.
- Copy Inputs on Outputs: if the user chooses this option, in case of ALL the inverters have accepted the input configuration, the input configuration itself will be copied on the outputs. In all other cases the output will be NULL.

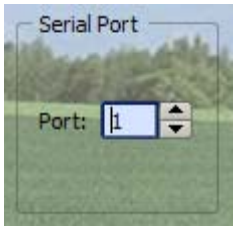
It's possible also to invert the input logic for each input.

Communication Status section

In this section the communication status is reported. When the Photovoltaic Power Control is connected, it reports also the firmware release of the equipment.

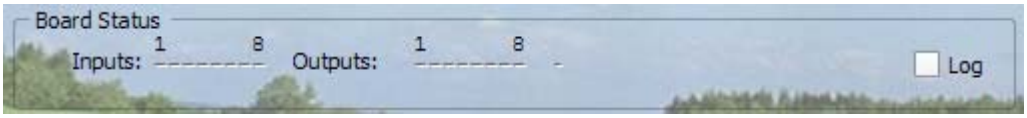
Serial Port section

This section allows the user to choose the serial port to use to connect the Photovoltaic Power Control.



Board Status section

This section is updated in real time while the software is connected. It shows the status of the inputs and of the outputs, the current Photovoltaic Power Control status. Selecting the Log checkbox is possible also to send all to a log file placed in the installation path.



Actions section

This section contains the following buttons:

- Connect: pressing this button the software tries to connect with the Photovoltaic Power Control equipment; when connected it changes to **Disconnect**.
- Defaults: pressing this button the software restore to defaults all the parameters.
- Save: this button sends the current displayed configuration to the Photovoltaic Power Control equipment
- Scan: this button makes the Photovoltaic Power Control equipment to initiate a scan of the 485 bus to discover automatically the inverters connected. The button changes to **Stop**. When the scan is complete or interrupted, the found inverters can be saved with the **Save** button.
- Quit: exits the application.

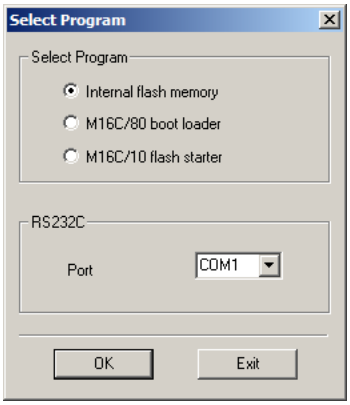
Updating the Photovoltaic Power Control firmware

To update the firmware of the equipment is necessary:

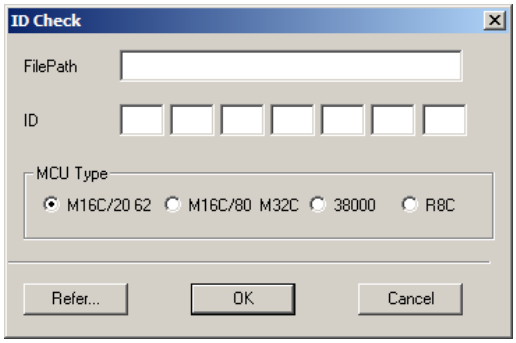
- The software to update the firmware, FlashSta.exe
- The firmware files (ppc.mot and ppc.id)
- A serial cable, connected between the PC and the PV Power Control Box equipment. The serial cable must be connected on the Serial 1/Serial 3 connector

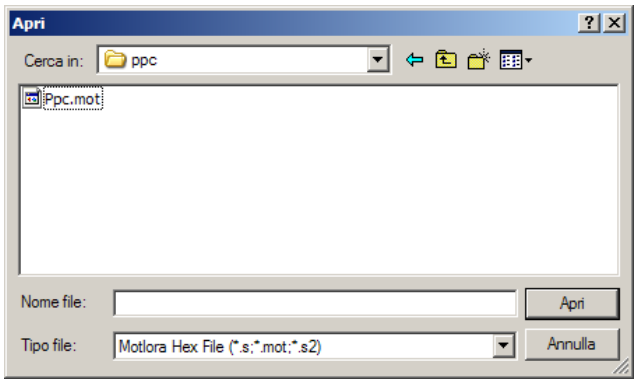
The procedure is as the following:

1. Power the equipment off and shorten pin 1 and 2 of JP13/JP14/JP15 and JP16
2. Connect the serial cable to the Serial 1/Serial 3 connector and to the PC
3. Power on the equipment. Only the PWR green led should be on
4. Start Flashsta.exe
5. Select the correct serial port and press Ok

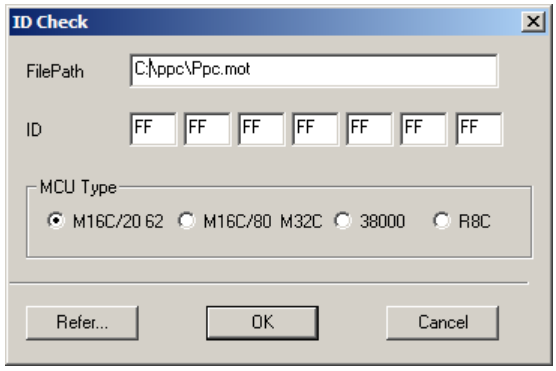


6. Into the new window press the Refer… button and browse to the ppc.mot and ppc.id files

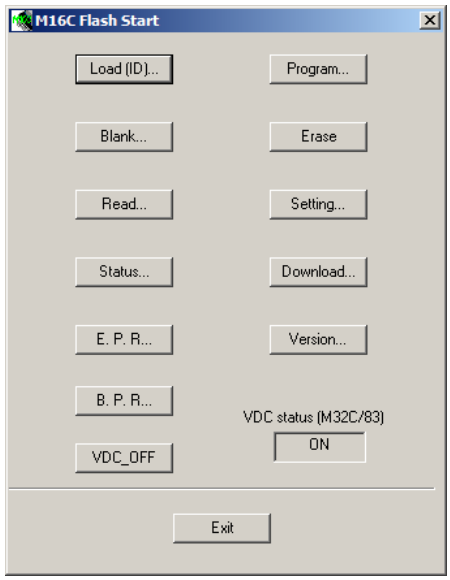




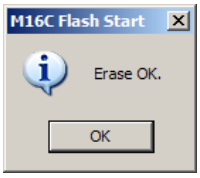
7. Select the file Ppc.mot and press Open.



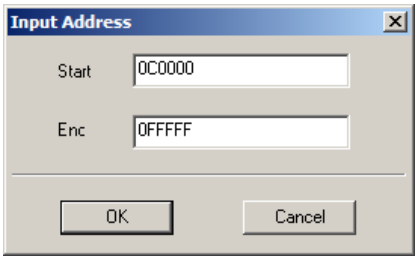
8. Press Ok. A new window appears:



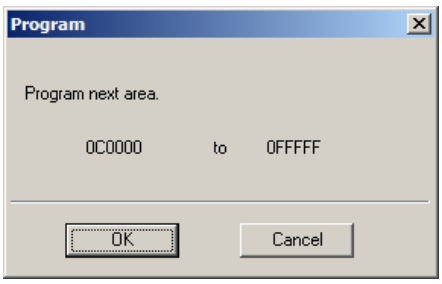
9. Press Erase, confirm and wait until finished . Press Ok once more:



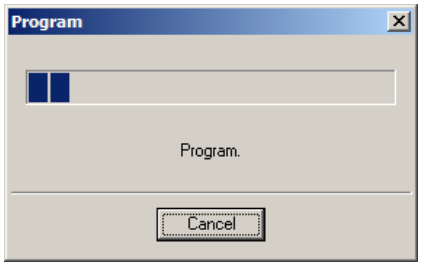
10. Press Program button and confirm the default values, pressing Ok.



11. Presso Ok again



12. The software now is programming the board:



13. Wait until the programming ends:

14. Exit the FlashSta.exe software, remove the jumpers on JP13/JP14/JP15 ad J16, power down the equipment and power it up again or reset.

Technical data

PV Power Control Box	
Input voltage	170 - 260 Vac (50 - 60 Hz) **OR** 9 ± 0.5 Vdc (max. current 600 mA)

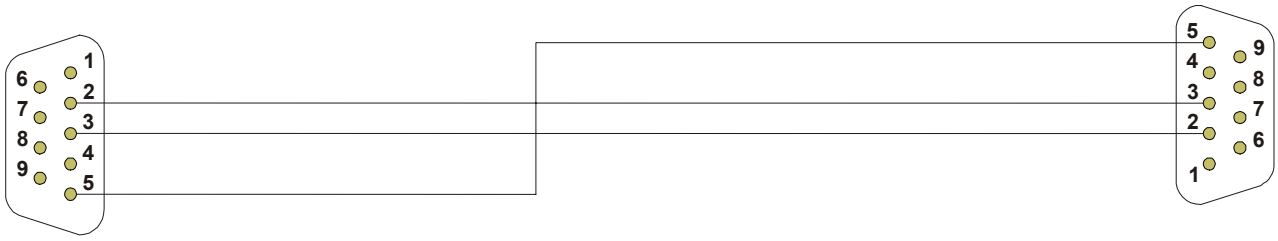
Operating temperature	0 – 40 °C
Storage temperature	-5 – 50 °C
Relative operating humidity	max.80%
Relative storage humidity	max. 90%

Dimensions	265 x 128 x 57 mm (“BOX” version)
Weight	1.4 Kg (“BOX” version)

Maximum load on each output (OUTPUT 1 - 8)	4A @ 250Vac
	4A @ 30Vdc

Maximum load per power supply Vdc = 5V	100 mA	Vdc = 4.9V @ 20mA
		Vdc = 4.5V @ 100mA

Serial cable specifications (Cross Cable – Female Female)



SERIAL1

Example of schematic diagram connection with Central Inverters at "PV POWER CONTROL BOX"